Space Weather Technical Forecast

Issued on Thursday, 11 November 2021 at 12:45 Local

This technical forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

Space Weather Forecast Headline: No significant activity expected.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar Activity was at Very Low levels, with occasional low B-class activity. There are currently three sunspot regions on the visible disc. AR2893 in the northwest and AR2894 in the south, near the meridian (both Hsx/Alpha) are mature and stable, unipolar sunspots. AR2895 (Dso/Beta), in the northeast quadrant has shown signs of decay with no significant flare activity observed. No Earth-directed CMEs were observed in available imagery.

Solar Wind / Geomagnetic Activity: The solar wind speed, as measured by DSCOVR was slightly elevated between 440 km/s, but gradually decreased during the period to background levels around 380 km/s. Density values were mainly average, with an increase to above average levels from 11/1015 UTC. Total IMF Bt was weak at mainly 4-6 nT, with an unremarkable north-south component Bz of +/- 5 nT. Phi angle was mainly positive (away from sun). Resultant geomagnetic activity was Quiet (Kp 0 to 2).

Energetic Particles / Solar Radiation: The high energy proton flux (greater than 10 MeV) as measured by GOES-16, was initially very slightly enhanced in response to the M-class flare on the 9th, but remained well below the S1 level. It has since returned to ambient levels. The high energy electron flux (greater than 2 MeV) was at moderate to background levels, peaking at 705 pfu at 10/1615 UTC. The 24-hour integrated fluence has been at normal background levels with a decreasing, then steady trend. The observed value at 11/0000 UTC was 2.14e7 integrated pfu.

Four-Day Space Weather Forecast Summary

Solar Activity: Solar activity is expected to be generally Very Low, with a chance of C-class flares.

Solar Wind / Geomagnetic Activity: There are no Earth-directed CMEs currently in the forecast. A weak CME is expected to pass ahead of Earth, with a weak glancing blow just possible, most likely on day 1 (11th). However, confidence is very low for this and any potential impacts are expected to be minimal.

Solar wind speeds are at slow ambient levels, but some slight enhancements are possible through the period. These most likely from weak coronal hole effects from the small CH18/- later in the period. Geomagnetic activity is expected to be mostly Quiet with a chance of isolated Unsettled intervals, and just a slight chance of isolated Active intervals, mainly from any possible weak coronal hole influence on day 3.

Energetic Particles / Solar Radiation: The high energy (greater than 10 MeV) proton flux is expected to be at or near background levels. The high energy electron flux (greater than 2 MeV) is expected to be at moderate to background levels, with a diminishing chance of reaching high levels during the diurnal peak. 24-hour electron fluence is expected to continue on a generally steady, or slight downward trend, below the Active (1e8 integrated pfu) threshold.

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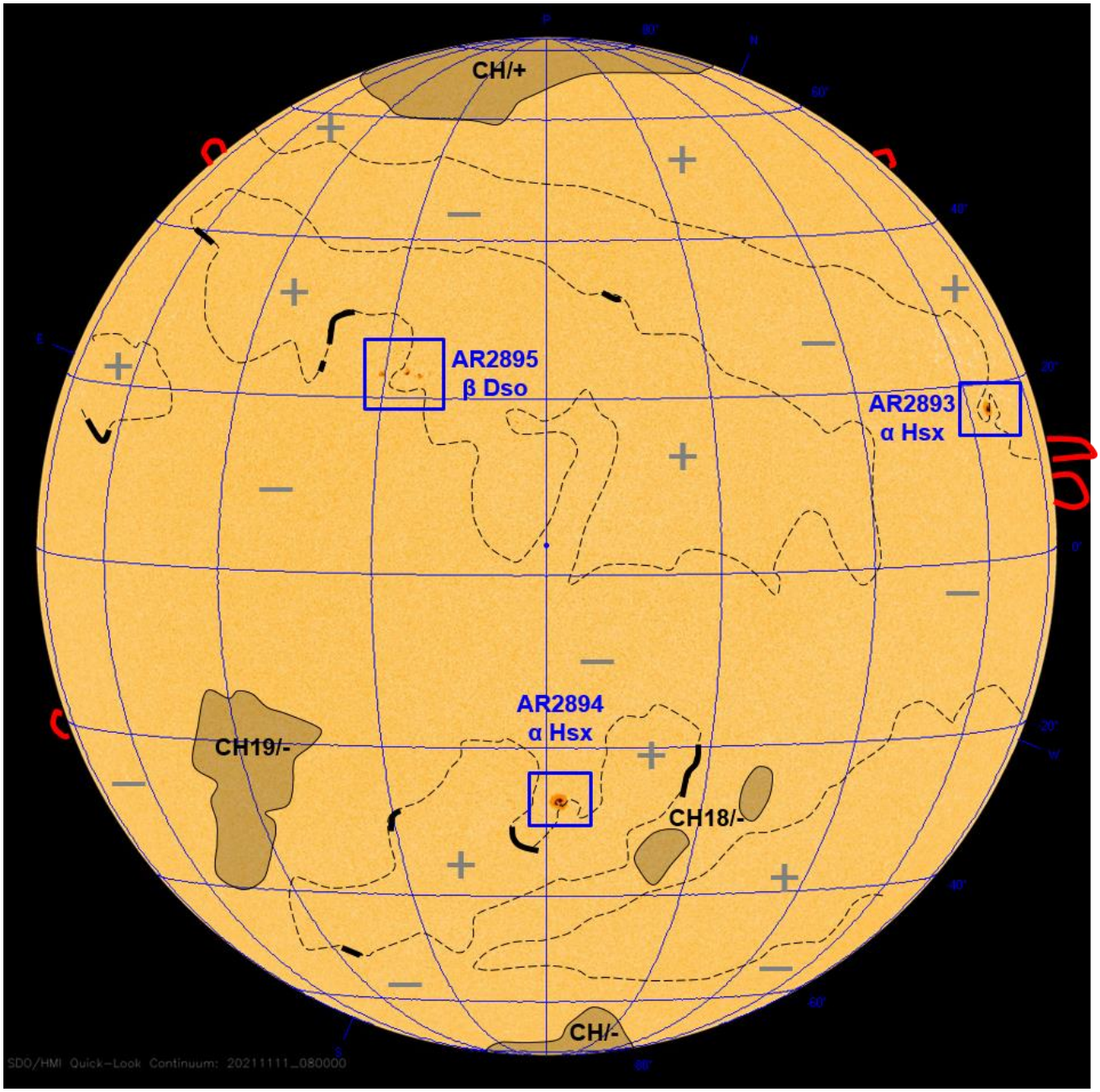
Figure 1. Solar Analysis Valid 11/0800 UTC.



Key: Filament ___ , Prominence ___ , Magnetic Field Line - - - , Polarity +/-, Coronal Holes: Grey shaded area CHxx +/-, Sunspot groups 25xx - Mt Wilson α-β-βγ-βγδ and Zurich-McIntosh Axx etc.

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Geomagnetic Storms:

There are no Earth-directed CMEs expected in the current forecast. A weak CME is expected to pass ahead of Earth, with a weak glancing blow just possible, most likely on day 1 (11th). However, confidence is very low for this and any potential impacts are expected to be minimal.

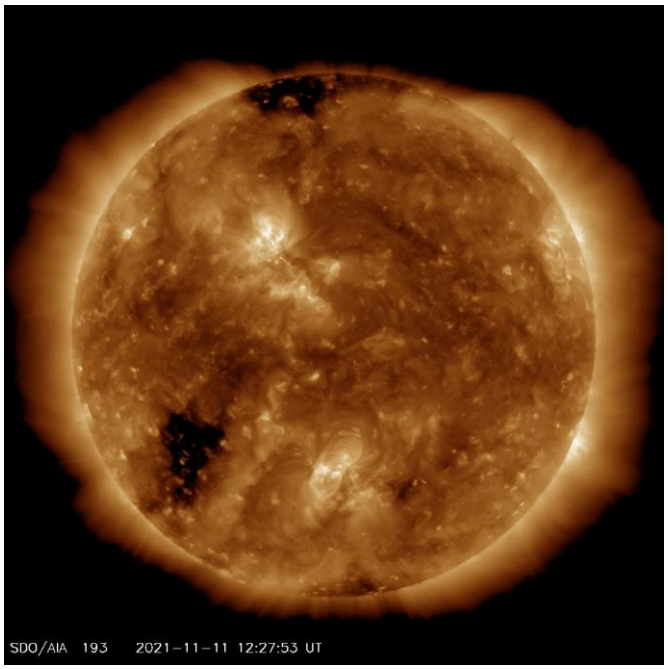
Solar wind speeds are at slow ambient levels, but some slight enhancements are possible through the period up to slightly elevated levels. This is most likely from weak coronal hole effects from the small CH18/- later in the period.

Geomagnetic activity is expected to be mostly Quiet with isolated Unsettled intervals, and just a slight chance low risk of isolated Active intervals, mainly from any possible weak coronal hole influence on day 3.

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	1	1	3	1
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Geomagnetic Activity - Earthbound Coronal Mass Ejections – Nil

Figure 2: SDO/AIA 93 imagery at 11/1227 UTC showing two coronal hole regions. CH18/- in the southwest quadrant and CH19/- a much larger region in the southeast.



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Met Office Space Weather Technical Forecast

Radio Blackouts - X-Ray Flares:

Generally Very Low solar activity is expected, with a chance of C-class flares. There are currently three magnetically simple regions on the visible disc. Of these, AR2895 (Dso/Beta) in the northeast gives the greatest potential for any flare activity.

Current far side STEREO EUVI imagery would suggest no further significant active regions likely to move into view through the next few days.

X Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability			(%)	(%)	(%)	(%)
Active	R1-R2 M Class	No	5	5	5	5
Very Active	R3 to R5 X Class	No	1	1	1	1

Solar Radiation Storms - (High Energy Protons):

No solar radiation storms are expected. The high energy proton flux (greater than 10 MeV) at GOES-16 was initially very slightly elevated (although well below S1/Minor Storm levels) in the wake of the M2 flare on 9th Nov. However, levels have since returned to background levels.

Radiation Storms	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Active	≥ S1	No	1	1	1	1
Very Active	≥ S3 *	No	1	1	1	1

* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)

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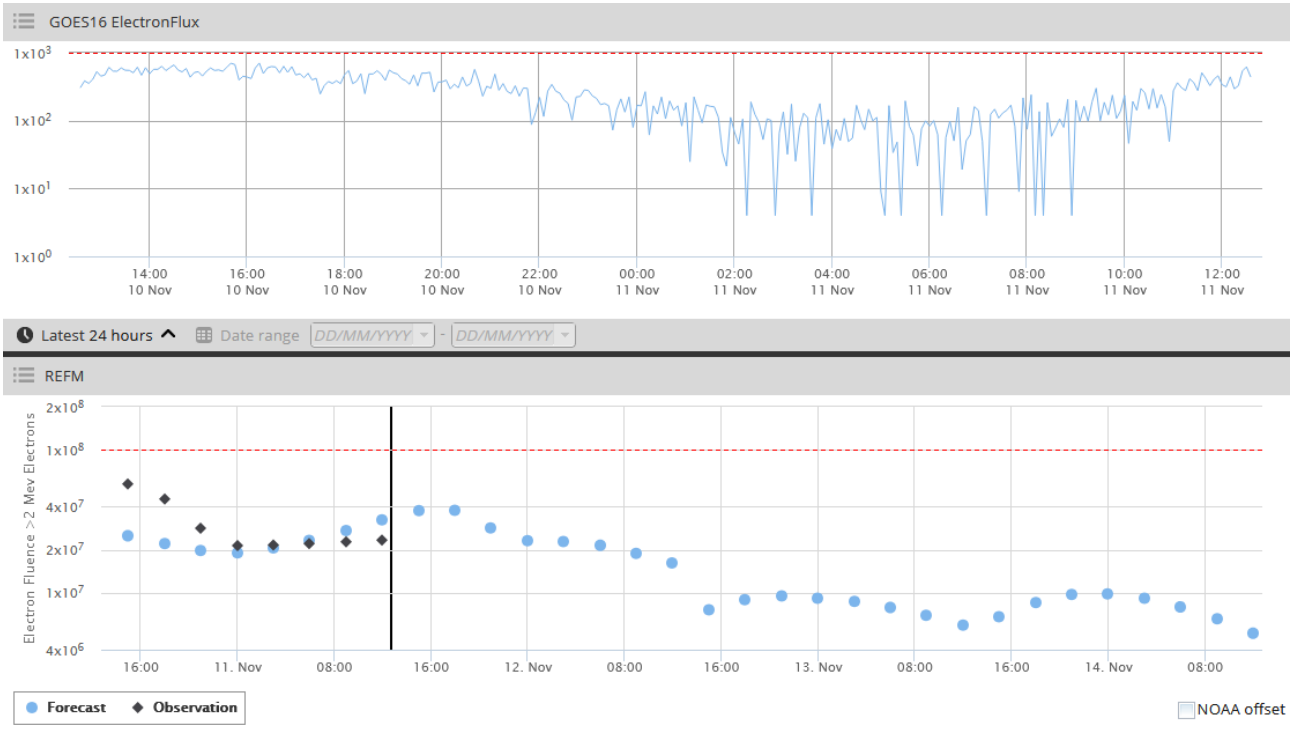
High Energy Electrons Event (≥ 2MeV):

High energy (greater than 2 MeV) electron flux at GEO is at moderate to background levels, and is likely to remain so in the coming days, with a diminishing chance of reaching high levels during the diurnal peak. Any possible weak coronal hole or CME effects are not expected to have a significant impact.

The associated 24-hour electron fluence is currently below the Active threshold, and is likely to see a generally steady or slow downward trend. The overall trend pattern of the REFM forecast data seems reasonable at present, with observations close to model expectations.

GEO Electron Environment	Level (cm^{-2} sr^{-1} day^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Active	≥ 2 MeV ≥ $1x10^8$	No	20	10	10	10
Very Active	≥ 2 MeV ≥ $1x10^9$	No	1	1	1	1

Figure 3: GOES16 Electron Flux and MOSWOC REFM output. Indicating background to moderate electron flux values in the past 24 hours and below Active fluence values. REFM is expected to give good guidance over the coming days.



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